

Overview

The purpose of this lesson is to introduce students to the concept of configuring TETRIX® DC motors using the Schematic Editor and to create a program with the TETRIX Move DC Motors function.

At the end of this lesson, students should be able to:

- Use the Schematic Editor to set up TETRIX DC motors.
- Move the TETRIX DC motors using the TETRIX Move DC Motors function.

Basics of LabVIEW™ for LEGO® MINDSTORMS®

The NXT Brick can be used to control TETRIX DC motors. For this to be done, the Schematic Editor must be used to give each motor a unique name and to specify how each motor is connected to the NXT Brick.

After opening the **Schematic Editor**, click the arrow next to **Sensor Port 1**. From the assortment of parts that comes up, select **HT DC Motor Controller**, as shown in Figure 1.

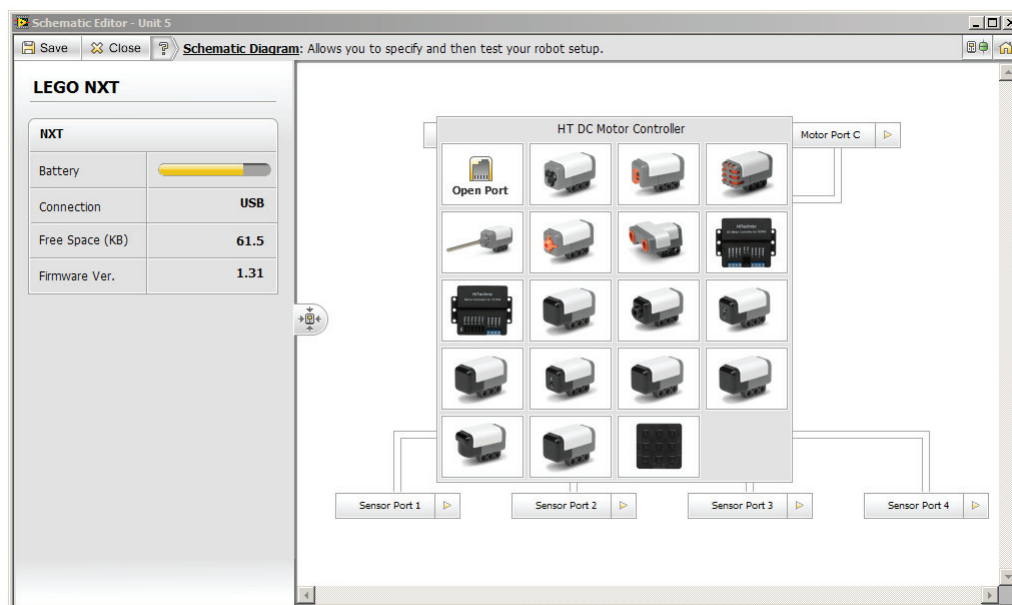


Figure 1. Selecting HT DC Motor Controller

Unit 5: Programming Guide

Note that an HT DC Motor Controller can be connected to Ports 1 to 4 only. The DC Motor Controller has two Motor ports and one Daisy Chain port, as shown in Figure 2.

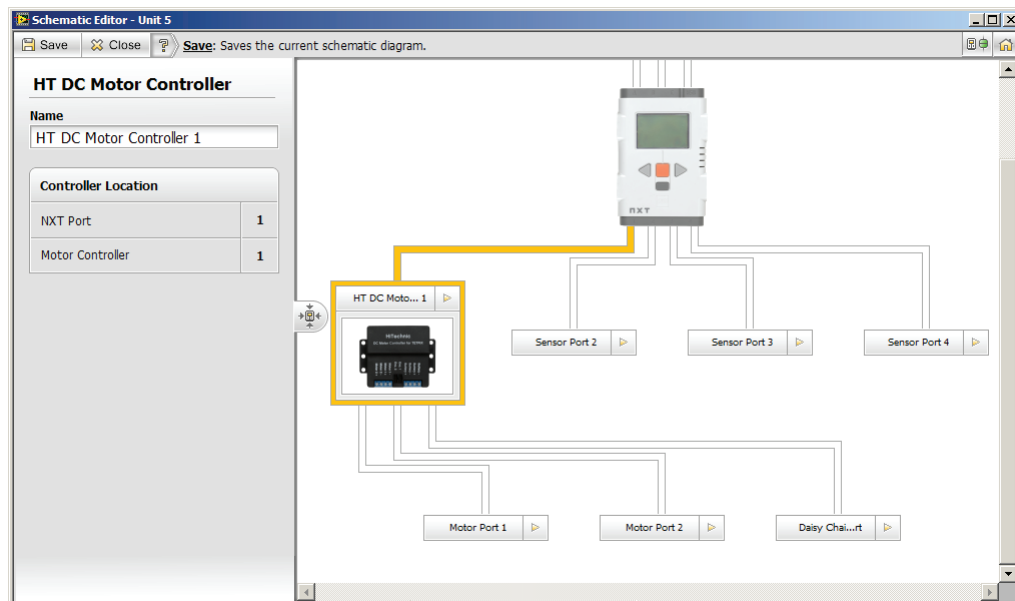


Figure 2. Edited Schematic Diagram

After the DC Motor Controller appears on the Schematic Diagram, scroll down and click **Motor Port 1**. Select **TETRIX® DC Motor**. Rename this motor by changing the **Name** field.

The Reverse box is useful if the two motors that are wired into the controller face opposite directions. Check this box to ensure that both motors rotate in the same direction when the same motor power has been wired into them. Consult Figures 3 and 4 to understand the specifications of the motors used. Also note that the left motor has been reversed while the right motor has not been reversed.

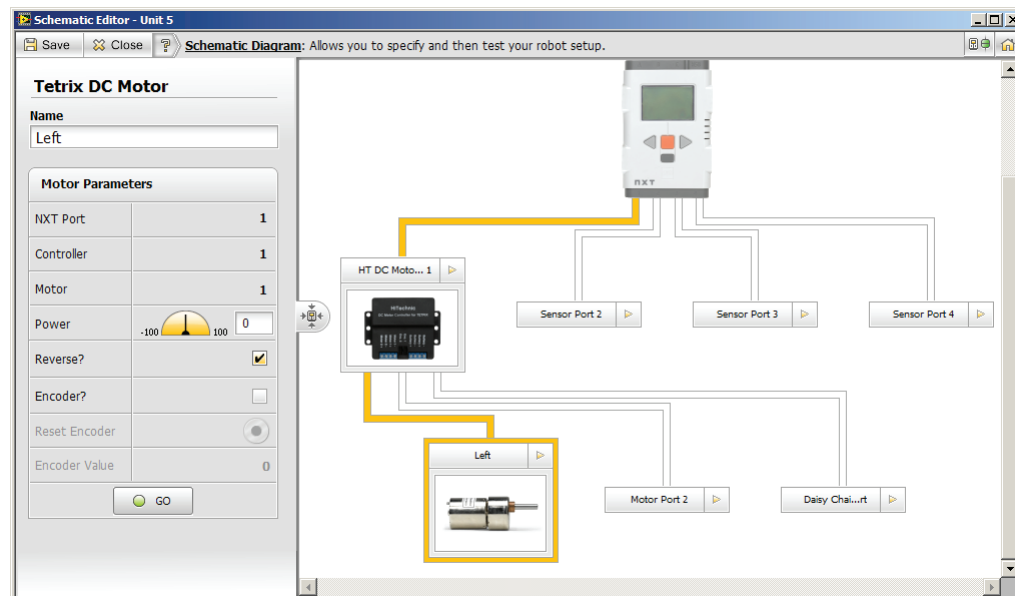


Figure 3. Configuring the Left Motor

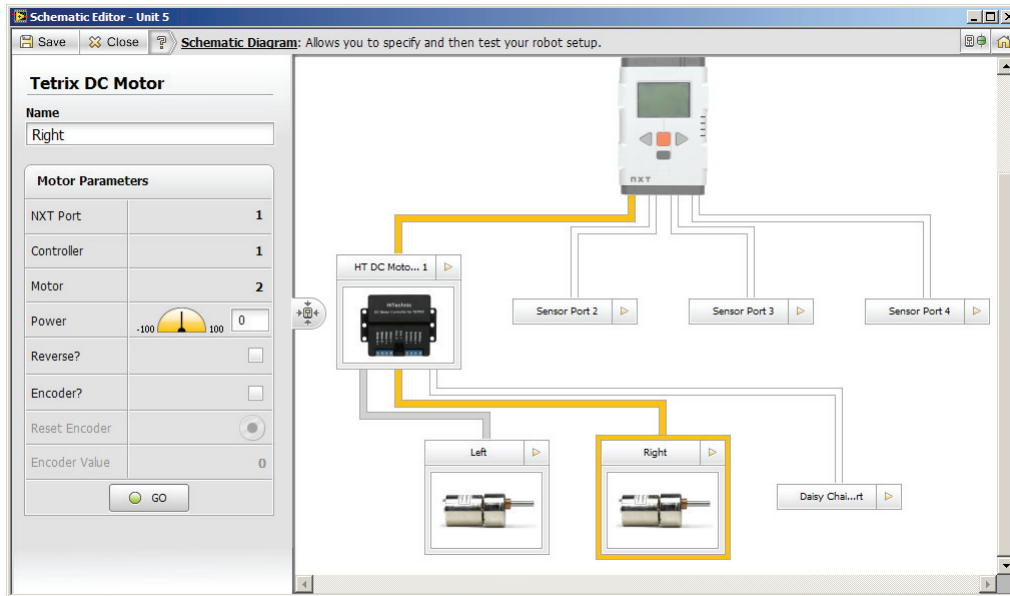


Figure 4. Configuring the Right Motor

Click **Save** before closing the window.

TETRIX® DC Motor

To access the motors that were specified in the schematic diagram, navigate to the **TETRIX®** sub-palette under **NXT Robotics** and select the **TETRIX Move DC Motors** function. Placing this onto the block diagram will create a function with a drop-down menu.

Clicking the arrow will show the choice between constant power and constant speed, as shown in Figure 5.

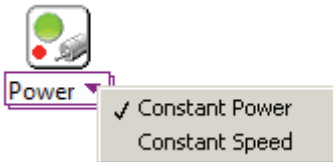


Figure 5. Polymorphic Selector of TETRIX Move DC Motors Function

The TETRIX Move DC Motors function is used to instruct the program to move a DC Motor. Open up the **Context Help** to analyze this function, as shown in Figure 6.

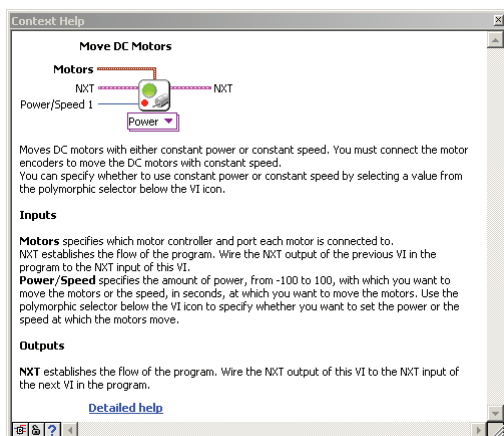


Figure 6. Context Help of TETRIX Move DC Motors Function

Unit 5: Programming Guide

The TETRIS Move DC Motors function has the usual NXT input and output terminals, a DC Motors input terminal, and a Power/Speed input terminal.

Use the Motors terminal to specify which motors the function will control. This is where it is possible to wire the DC Motors specified earlier in the Schematic Editor.

The Power/Speed terminal can also be used to indicate the power or speed of the motor. The range of values is -100 to 100. A value of zero indicates no motion. Negative values reverse the direction of rotation for the DC Motors.

Right-click the **Motors** terminal to select the motors that will be controlled by this function. In the drop-down menu that appears, select **Create Constant**, as shown in Figures 7 and 8.

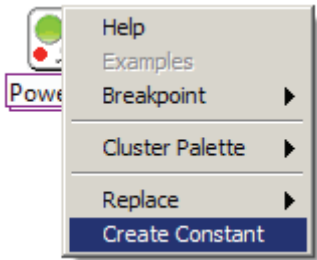


Figure 7. Creating Constant to select motors

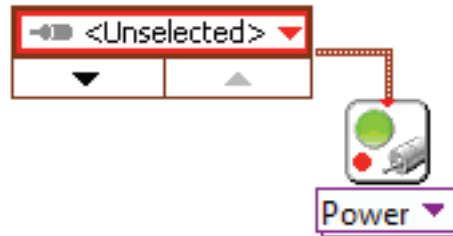


Figure 8. Changed Motor Function

A single TETRIS Move DC Motors function can be used to control more than one motor. To do this, click the down arrow at the bottom of the Motors constant to expand it.

To select which motors will be connected, click the pull-down arrow inside the **<Unselected>** constant and select the appropriate motor from the list that appears, as shown in Figure 9.

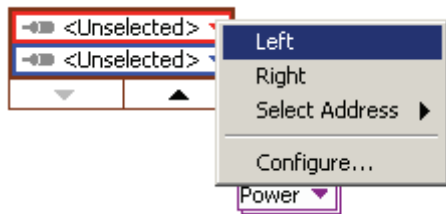


Figure 9. Selecting Motors

To set the power or speed of the motors, right-click the **Power/Speed** terminal and click **Create Constant**. If more than one motor has been connected, each motor will have its own Power/Speed terminal, signified by a colored dot matching the color scheme of the Motors constant, as shown in Figure 10.

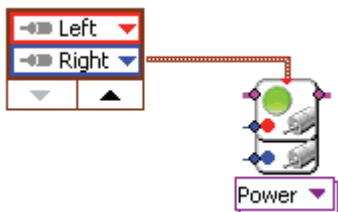


Figure 10. Various Terminals for Connecting Constants

For now, connect only the **left motor** to a **TETRIS Move DC Motors** function by collapsing the Motors constant using the **up arrow**. Create a constant for its **Power/Speed** terminal and set it to **50**.

Note that if the code were to be run as is, the motor would run briefly before stopping because the program is finished. This can be prevented by putting the function into a **While Loop** and setting the **Conditional** terminal to **False**. The program should look similar to the program in Figure 11.

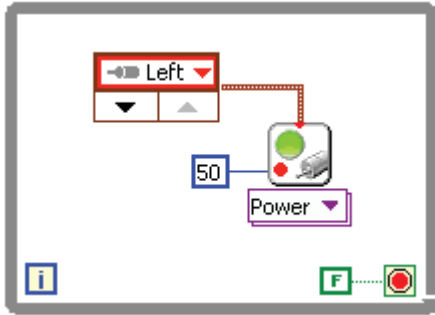


Figure 11. While Loop Around the TETRIX® Move DC Motors Function

Run the program and notice that the motor will run forever, as expected. Manually abort the program to stop it.

Now remove the **While Loop** by right-clicking it and clicking **Remove While Loop**. Also, delete the Boolean constant.

Create a **Wait For** function and set its Time terminal to **10**. Create another **TETRIX Move DC Motors** function, wire in the **DC Motor** and set its **Power/Speed** terminal to **0**. Wire up the **NXT** terminals of the functions, starting at the **TETRIX Move DC Motors** function on the left, then the **Wait For** function, and ending on the **TETRIX Move DC Motors** function on the right. Recall that the role of these NXT wires is to ensure that the functions run in the order in which they have been set. The program should look similar to the program in Figure 12.

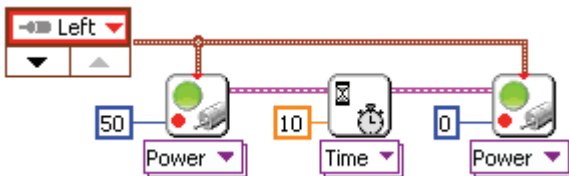


Figure 12. TETRIX Move DC Motors Function and Wait For function

Run the program and observe that the left motor runs for 10 seconds before stopping.